REMARKS

By the present amendment, claims 8 to 12 are pending in the application.

Restriction Requirement

Applicants hereby affirm the telephone election of the claims of Group I, i.e., product claims 1 to 4.

Applicants submit that new claims 8 to 12 of the present amendment correspond to elected product claims 1 to 4 because new claims 8 to 12 of the present amendment are directed to ultralow carbon steel slabs and sheets.

Withdrawn, non-elected method claims 5 to 7 have been canceled by the present amendment without prejudice to the filing of a divisional patent application directed to the subject matter of non-elected, withdrawn method claims 5 to 7.

Support For Claim Amendments

Claims 8, 9 and 10

The chemical composition of the steel of new independent claims 8, 9 and 10 is based upon the chemical composition of the steel of original claims 1 and 2.

The new lower limit of S, i.e, 0.005%S, is supported by Table 1 at page 16 of the specification wherein the S content of Steel No. 3 is 0.005%. This is the lowest example of S in the examples of steels in accordance with the present invention.

The new lower limit of acid soluble A1 of 0.001% is supported by Table 1 at page 16 of the specification wherein the acid soluble A1 content of Steel Nos. 1 and 3 is 0.001%. This is the lowest example of acid soluble A1 in the examples of steels in accordance with the present invention.

The new lower limit acid soluble Ti of 0.015% is supported by Table 1 at page 16 of the specification wherein the acid soluble Ti content of Steel No. 3 is 0.015%. This is

the lowest example of acid soluble Ti in the examples of steels in accordance with the present invention.

Complex oxides of at least La oxides, Ce oxides and Nd oxides with Ti oxides is disclosed in the specification at page 15, lines 8 to 9.

The cerium, lanthanum and neodymium oxysulfites appear in original independent claims 1 and 2.

The use of cerium, lanthanum and neodymium oxysulfites to fix the solute S is disclosed in the specification at page 14, lines 32 to 34.

Observing the inclusions in a cross-section perpendicular to the rolling direction by a secondary electron image of a scan type electron microscope and analyzing the composition of about 50 randomly selected inclusions is disclosed in the specification at page 14, lines 13 to 19.

Claim 8

A "cast slab" is disclosed in the specification at page 12, line 2.

Claims 8 and 9

$Ti_4C_2S_2$, which is formed during hot rolling, is disclosed in the specification at page 12, line 6.

Claim 10

A recrystallize grain diameter of 15 μm or more and total elongation of 50% or more is disclosed in the specification at page 13, lines 13 to 16.

A r-value of 2.0 or more is disclosed in the specification at page 13, lines 20 to 21.

Cold rolling and annealing after cold rolling is disclosed in the specification at page 12, lines 24 to 25.

§103

Claims 1 to 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Japan No. 06-065647 in view of Japan No. 2003-268435.

This rejection, as applied to new claims 8 to 12, is respectfully traversed.

Patentability

Japan No. 06-065647 (the "'647 patent")

The technology disclosed in the '647 patent relates to a cold-rolled steel sheet having deep drawability (high r value), where the most important feature is twice cold rolling and twice annealing. The '647 patent carries out cold rolling at 70-85% draft and continuous annealing at 840-900°C and moreover subjects the steel sheet to cold rolling at more than 50%, total draft of more than 85% and continuous annealing at 840-900°C for further improving deep drawability.

However, the present invention is carried out with only one cold rolling and annealing which is quite a different process from the '647 patent.

Further, the '647 patent does not disclose or suggest that the cast slab or hot- and cold rolled steel sheet contains complex oxides of at least La oxides, Ce oxides and Nd oxides with Ti oxides and at least cerium oxysulfite, lanthanum oxysulfite, and neodymium oxysulfite as oxysulfite to fix the solute S, with observed inclusions in a cross-section perpendicular to the rolling direction examined by a secondary electron image of a scan type electron microscope, and with the composition of about 50 randomly selected inclusions analyzed. The '647 patent does not disclose or suggest $Ti_4C_2S_2$, or crystal grain growth during continuous annealing.

In the '647 patent, the inventive steel Nos. A and B containing S:0.004% in Table 1, and exhibits higher r value (Randford value) processed by twice cold rolling and twice annealing as shown in Table 3.

The S content in the present invention is 0.005-0.009% as shown in Table 1 at page 16 of the specification. This means that the '647 patent does not process the cast slab

with formed oxysulfite by hot rolled to provide $Ti_4C_2S_2$ for improving r value by grain growth. In addition, the '647 patent does not disclose or suggest the present inventive steel sheet produced only by one step cold rolling and annealing.

Therefore, the '647 patent is quite different from the present invention.

Further, although the '647 patent discloses in paragraph [0004] that {111} texture which contributes to improve the r value (Rankford Value) by means of the first annealing of more than 840°C, paragraph [0011] discloses that r value lowers if the cold rolling reduction is less than 50%, and r value is lowered. The '647 patent further discloses in paragraph [0011] that if a temperature of the second annealing is lower that 840°C, r value is lowered. This means that repeated cold rolling and annealing has a synergistic effect on an improvement of r-value in the '647 patent.

On the other hand, there is no secondary cold rolling and annealing in the present invention.

In addition, the '647 patent discloses in paragraph [0004] that although {111} texture is increased for improving r-value by means of the first annealing, and secondary cold rolling with reduction ratio of 60%, if the temperature of the second annealing is at 780°C, a lower r-value of only 1.9 is obtained. Therefore, the '647 patent is carried out with both annealings at more than 840°C. The '647 patent does not disclose or suggest what result is obtained by a one step cold rolling and annealing.

On the other hand, the present invention obtains a recrystallized grain diameter of more than 15μm, r-value of more than 2.0 and total elongation of more than 50% after one step cold rolling and one step annealing. The '647 patent does not disclose or suggest these present inventive results.

JP 2003-268435 (the "'435 patent")

The technology disclosed in the '435 patent relates to a low-carbon thin steel sheet where Ti of more than 0.005% is added to a molten steel containing a high amount of

dissolved oxygen and forms a solid phase TiOn system inclusions, and Nd is added for reductive decomposition, and then disperses a fine Nd_2O_3 system inclusions or TiOn - Nd_2O_3 system inclusions into the molten steel for preventing surface damages of the cold rolled steel sheet by means of refining inclusions, as disclosed in paragraph [0017].

On the other hand, the present invention aims for form oxysulfite in the molten steel and, before coiling the hot rolled sheet, the C in the steel sheet is fixed as $Ti_4C_2S_2$ so the amount of precipitation of fine carbides (diameter of several 10 nm) precipitating at the time of coiling can be greatly reduced for increasing r-value and elongation after cold rolling and annealing by means of grain growth.

In other words, the '435 patent only discloses sulfide, such as fine sulfide, having a diameter of 0.5-30μm is dispersed in the cast slab as 1000-100000 piece/cm2 and more than 60% of spheroidal oxide containing Nd [0009], and does not disclose or suggest the S content as $0.005\% \leq S \leq 0.01\%$, oxysulfite and $Ti_4C_2S_2$. The La-, Ce- and Nd oxysulfites according to the present invention are of relatively large size (several um) which is different from fine oxides defined in the '435 patent. As a result, it is submitted that there are no La-, Ce- and Nd oxysulfites in the '435 patent.

Further, the '435 patent discloses "..deoxidized by Ti and Ti concentration fixed as 0.01 mass%" [0015]. This Ti concentration is different from the Ti content of 0.015 mass%≤acid sol T≤0.07mass% defined in the present invention. It is submitted that there is no formation of $Ti_4C_2S_2$ in the '435 patent.

In addition, the '435 patent discloses that "a slab is hot rolled, cold rolled into a cold rolled steel sheet having a thickness of 0.7 mm and width of 1800 mm. A quality inspection of a slab is carried out by visual examination in the inspection line which is evaluated as a number of surface defects observed in a coil" [0015]. This means that an

annealing after cold rolling is not carried out. Therefore, it is difficult to image properties of the cold rolled steel sheet in the '435 patent. As a result, the '435 patent does not disclose or suggest a characteristic feature of the present invention, such as the condition of the oxysulfite formation, existence of oxysulfite, the formation of $Ti_4C_2S_2$, and an improvement of the r-value processed by one step cold rolling and annealing.

Therefore, the '435 patent is quite different than the present invention.

It is therefore submitted that the new claims 8 to 12 are patentable over Japan No. 06-065647 in view of Japan No. 2003-268435.

CONCLUSION

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

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